8. LM INVESTIGATIONS OF PARTIALLY DISSOLVED SPOROMORPHS III.

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Abstract

Pollen grains of the following species were partially dissolved: *Pinus sylvestris* L., *Magnolia kobus* DC., *Althaea rosea* (L.) CAV., *Alnus glutinosa* (L.) GÄRTN., *Zea mays* L. KSC 370 *saccharata* hybrid. The following organic solvents were used for partial dissolution: diethylamine, merkaptoethanol, methanol, ethanol, n-propanol, and i-amyl alcohol. Temperature: 30 °C, length of time: 30, 90, 150, 210, 270 and 330 days. The ectexine of the investigated species is relatively resistant. Complete dissolution was not observed during these experiments. No alterations were observed at the pollen grains of *Pinus sylvestris*, this corresponds to the previous experiments on the saccate *gymnosperm* pollen grains. Minor alterations were observed on the pollen grains of *Magnolia kobus* and *Alnus glutinosa*. Pollen grains of *Althaea rosea* are also resistant but diethylamine after 270 and 330 days dissolved the outer ornamental elements, the spinae. The most important alterations were observed on the pollen grains of *Zea mays saccharata* after dissolution in diethylamine and merkaptoethanol particular after 270 days.

Key words: Palynology, recent, pollen grains, partial dissolution, LM method.

Introduction

The aim and the problems of this kind of research program of our Laboratory were published previously (KEDVES, KÁROSSY and BORBOLA, 1997). Different pollen types of different taxonomical position were investigated with the same method (KEDVES et al., 1998). This contribution presents recent results within this research program.

Materials and Methods

Pollen grains of the following species were the subject of the present studies:

Pinus sylvestris L.

Locality: Botanical Garden of the J.A. University. Collected: Á. ERDŐDI on 09.05.1987. Beginning of the experiments: 12.05.1997. Numbers of experiments: 1/7 - 859-900.

Magnolia kobus DC.

Locality: Garden of the J.A. University. Collected: Á. ERDŐDI on 24.03.1997. Beginning of the experiments: 24.03.1997. Numbers of experiments: 1/7 - 761-802.

Althaea rosea (L.) CAV.

Locality: Left bank of the river Tisza., at Szeged. Collected: E. HORVÁTH on the 01.07.1997. Beginning of the experiments: 07.07.1997. Numbers of experiments: 1/7 - 930-977.

Plate 8.1., 1-42. *Pinus sylvestris* L.

Plate 8.2., 1-42. *Magnolia kobus* DC.

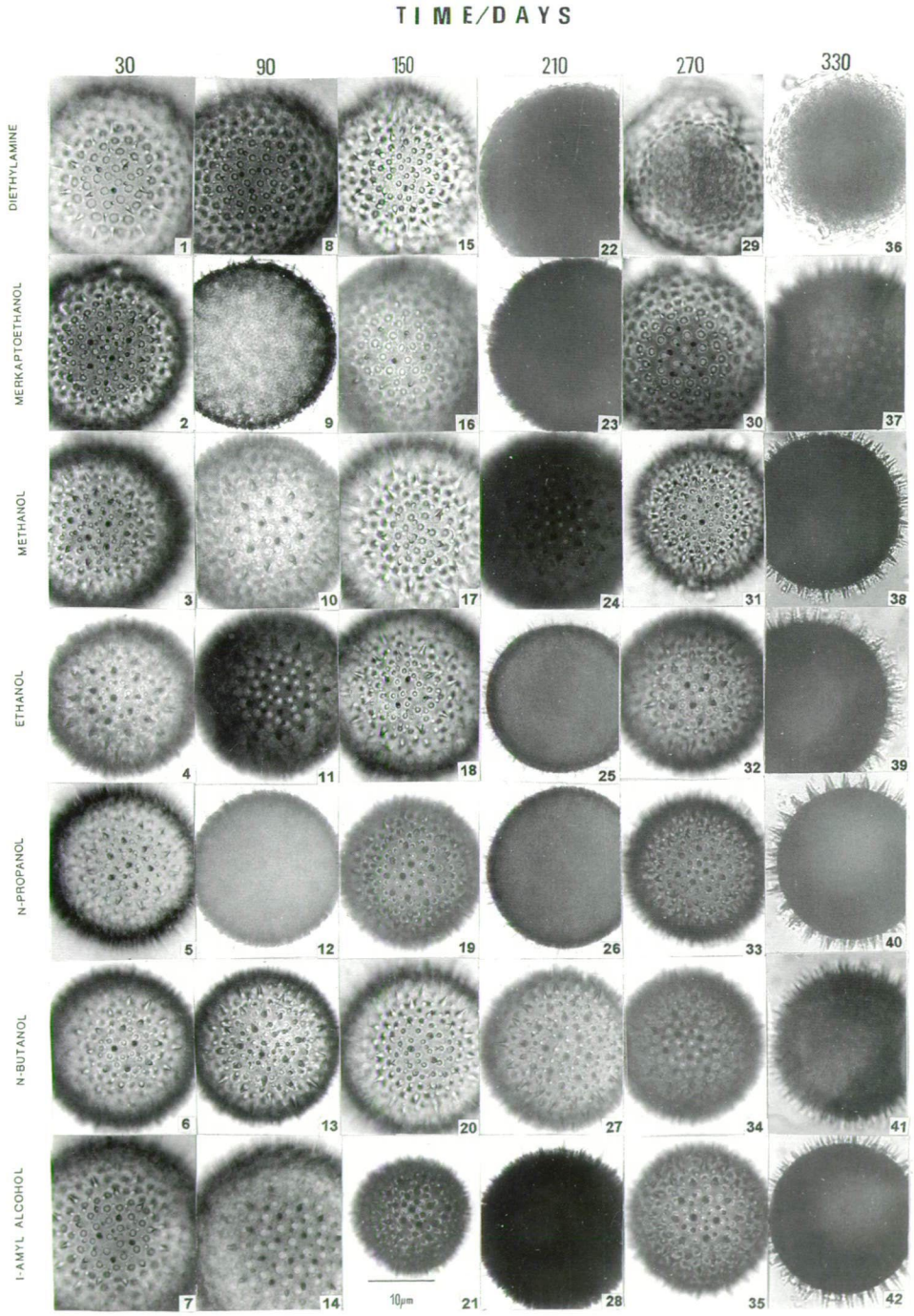

Plate 8.3., 1-42. *Althaea rosea* (L.) CAV.

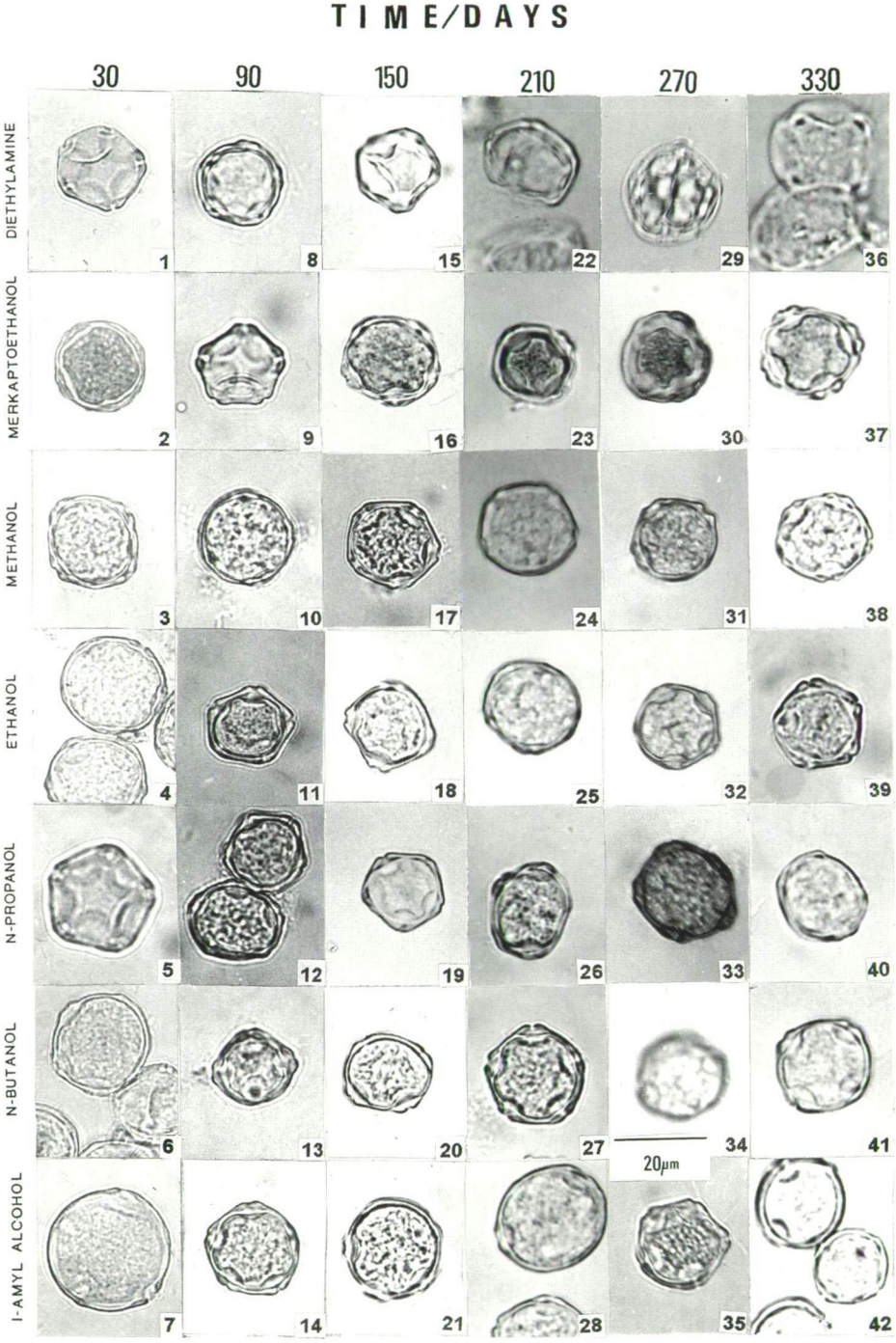

Plate 8.4., 1-42. *Alnus glutinosa* (L.) GÄRTN.

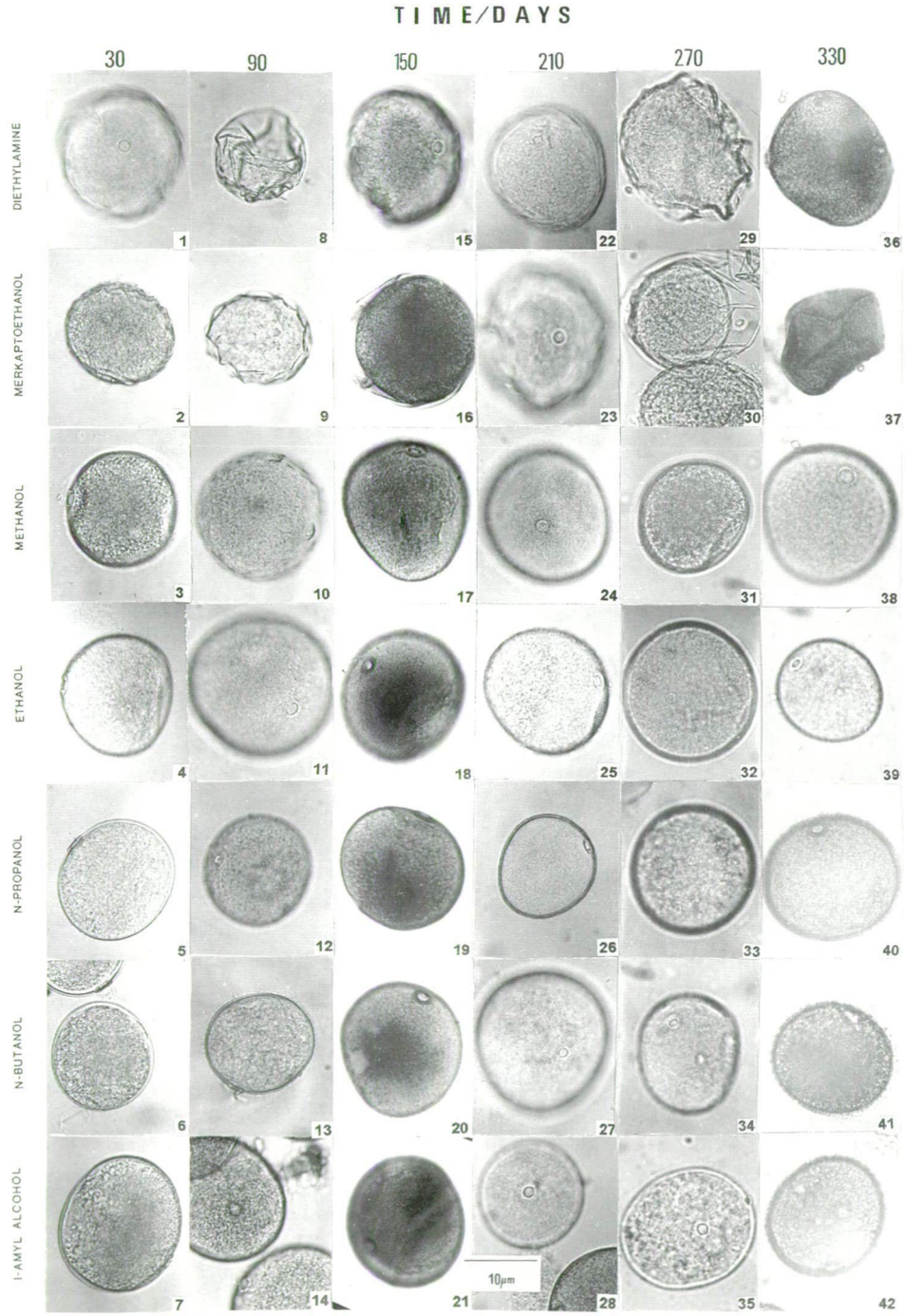

Plate 8.5., 1-42. *Zea mays* L. KSC 370 *saccharata* hybrid

Alnus glutinosa (L.) GÄRTN.

Locality: Botanical Garden of the J.A. University. Collected: Á. ERDŐDI on 07.03.1997. Beginning of the experiments: 12.03.1997. Numbers of experiments: 1/7 - 718-759.

Zea mays L. KSC 370 *saccharata* hybrid

Locality: Ságvári Experimental Research Station of the Cereal Research Institute. Collected: Dr. A. PALÁGYI on the 02.08.1997. Beginning of the experiments: 05.08.1997. Numbers of experiments: 1/7 - 988-1036.

The method of the partial dissolution is completely identical with the earlier, which was first described in our first paper (p. 45) and was repeated in the second part (p. 77). The solvents and the length of time of the partial dissolution are well shown in the Plates 8.1-8.5.

Results

Pinus sylvestris L. (Plate 8.1., figs. 1-42)

Pollen grains of this species are very resistant to the used solvents of this kind of experiment. Minor qualitative morphological alterations were observed in the apertural area, but these may not be considered significant.

Magnolia kobus DC. (Plate 8.2., figs. 1-42)

Minor qualitative morphological alterations were observed only, which may be the consequence of the so-called intraspecific morphological variation. Worth of mentioning is that after 330 days of experiments the original monosulcate form was observed.

Althaea rosea (L.) CAV. (Plate 8.3., figs. 1-42)

Important alterations in the LM morphology of this kind of interesting pollen grains were observed after partial dissolution with diethylamine. After dissolution of 30-150 days the diameter of the pores increased. From 210-330 days of dissolution the echinate sculptural elements disappeared. The alteration of the diameter of the pores appeared after the experiments with merkaptoethanol, and i-amyl alcohol.

Alnus glutinosa (L.) GÄRTN. (Plate 8.4., figs. 1-42)

Several kinds of morphological alterations were observed, the most characteristic ones are as follows: Diethylamine after 270 and 330 days damaged the pollen grains, the size increased and the ectexine structure seems also to be damaged. Alterations in the basic morphology of the apertural area were observed after dissolution with merkaptoethanol. This started after 150 days, and very characteristic at the end of this experiment (Plate 8.4., fig. 34). Alterations in the contour of the pollen grains were also observed for example figs. 7, 25, 28, 34 on the Plate 8.4.

Zea mays L. KSC 370 *saccharata* hybrid (Plate 8.5., figs. 1-42)

Important qualitative alterations were observed by the dissolution with diethylamine and merkaptoethanol. The ectexine altered, the outer layers fold out from the inner one. This started after 30 days of dissolution but particularly characteristic after 270 days.

Discussion and Conclusions

1. The molecular system of the sporopollenin of the pollen grains of the recently investigated species is quite resistant because complete dissolution was not observed.

To this see Plate 5.3. (*Platanus hybrida* BROT.) and 5.4. (*Tilia platyphyllos* SCOP.) in the paper of KEDVES et al., (1998).

2. Pollen grains of *Pinus sylvestris* were the most resistant within this series of experiments. But on the other hand it is interesting that from the partially degraded exine of *Pinus griffithii* first the quasi-crystalloid biopolymer system (KEDVES, 1987) was observed. Further experiments on saccate *gymnosperm* pollen grains resulted in very characteristic molecular structures (KEDVES, 1992).

3. Interesting and important is the resistant sporopollenin of the *Magnolia* pollen grains. Taking into consideration the evolutionary trends of the earliest *angiosperm* pollen grains (cf. DOYLE, 1977) the *Magnoliaceae* was very important in this point of view.

4. Pollen grains of the *Malvaceae* will be another program of research because of several reasons, for example the globular form, the polyporate exine, the peculiar ornamentation, and the superficial covering material. Important alterations in the LM morphology were observed only after a long time of partial dissolution with diethylamine and merkaptoethanol.

5. In comparison with *Betula verrucosa* EHRH. there are minor alterations at the pollen grains of *Alnus glutinosa*.

6. Finally the first data in this respect on the pollen grains of "*Gramineae* type" resulted in interesting alterations by dissolution with diethylamine and merkaptoethanol. These alterations suggest the necessity of the transmission electron microscope method also for these pollen grains.

Acknowledgements

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